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THE UNITED STATES PATENT AND TRADEMARK OFFICE

AMENDMENT "B" ACCOMPANYING RCE

APPLICANT(S): Tohisharu Yanagida OLD DOCKET NO.: P99,1318
NEW DOCKET NO.: 09792909-4298
SERIAL NO.: 09/385,959 GROUP ART UNIT: 2814
DATE FILED: August 30, 1999 EXAMINER: D. Graybill
INVENTION: "SEMICONDUCTOR APPARATUS AND PROCESS OF
PRODUCTION THEREOF"

COPY OF PAPERS
ORIGINALLY FILED

Hon. Assistant Commissioner for Patents
Washington, DC 20231

S I R:

This Amendment "B" accompanies and RCE and is filed in response to the Final Office Action of June 5, 2002. Please reconsider the application in view of the amendment and remarks presented below.

IN THE CLAIMS

Please amend claim 7 as follows:

7. (Amended) A process of production of a semiconductor apparatus comprising:
a first step of forming metal ball bumps in direct contact with a circuit pattern of a semiconductor device,
a second step of forming a resin film on a circuit pattern forming surface of said semiconductor device so as to seal spaces between said metal ball bumps and to become thinner than a height of the metal ball bumps, and
a third step of cleaning the surfaces of the metal ball bumps projecting out from the resin film.

Please cancel claim 9.

REMARKS

Claims 1-24 are pending in the application. Claims 1-6 are withdrawn from consideration as being directed to non-elected inventions. In the Final Office Action of June 5, 2002, the Examiner made the following disposition:

- A.) Rejected claim 9 under 35 U.S.C. §112, second paragraph.
- B.) Rejected claims 7-11, 16, and 19-24 under 35 U.S.C. §102(e) as being anticipated by *Hayes*.
- C.) Rejected claims 12, 13, and 17 under 35 U.S.C. §103(a) as being unpatentable over *Hayes* in view of *Nishikawa et al.* and *Denning et al.*
- E.) Rejected claims 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over *Hayes* in view of *Nishikawa et al.* and *Denning et al.* and further in view of *Okumura*.
- F.) Rejected claim 18 under 35 U.S.C. §103(a) as being unpatentable over *Hayes* in view of *Jackson*.

Applicant respectfully traverses the rejections. Applicant addresses the Examiner's disposition as follows:

A.) Rejection of claim 9 under 35 U.S.C. §112, second paragraph:

Claim 9 has been cancelled.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

B.) Rejection of claims 7-11, 16, and 19-24 under 35 U.S.C. §102(e) as being anticipated by *Hayes*:

Applicant respectfully disagrees with the rejection.

Applicant's independent claim 7 claims a process of production of a semiconductor apparatus comprising a first step of forming metal ball bumps in direct contact with a circuit pattern of a semiconductor device. In a second step, forming a resin film on a circuit pattern forming surface of the semiconductor device so as to seal spaces between said metal ball bumps and to become thinner than a height of the metal ball bumps. In a third step, cleaning the surfaces of the metal ball bumps projecting out from the resin film.

As illustratively depicted in Applicant's Fig. 4C, Applicant's bumps are specifically metal "ball" bumps. Further, Applicant's metal ball bumps are formed in direct contact with a circuit pattern of a semiconductor device.

This is clearly unlike *Hayes*, which fails to disclose Applicant's first, second, and third claimed steps. Referring to *Hayes* Figs 2 and 3, *Hayes* discloses forming solder columns 3, instead of bumps, to connect to a circuit pattern 2 of a semiconductor device 5. A polymer film 4 is then deposited between the solder columns 3. A top surface of the polymer film 4 is then removed to expose tops of the solder columns 3. Then, solder ball bumps 9 are formed onto the tops of the solder columns 3.

Thus, unlike Applicant's claim 7, *Hayes*'s solder ball bumps 9 are neither formed in direct contact with *Hayes*'s circuit pattern 2 (unlike Applicant's claimed step 1), nor sealed by resin film 4 (unlike Applicant's claimed step 2), nor cleaned (unlike Applicant's claimed step 3). Instead *Hayes*'s solder ball bumps 9 are formed on top of solder columns 3 that are formed in direct contact with *Hayes*'s circuit pattern 2.

The Applicant respectfully notes the definition of bump provided by the Examiner, however, Applicant's claimed bumps are further limited to being solder ball bumps, which are clearly not anticipated by *Hayes*'s solder columns. *Hayes*'s solder columns 3 are merely provided as bases for *Hayes*'s solder ball bumps 9. Unlike Applicant's claimed solder ball bumps, *Hayes*'s solder columns 3 are not provided for flip-chip-type connection, while its solder ball bumps 9 are so provided. *Hayes*'s solder columns 3 are merely provided for supporting solder ball bumps and, thus, fail to disclose or even suggest Applicant's solder ball bumps.

Accordingly, *Hayes* fails to disclose or even suggest Applicant's claim 7.

Further, unlike Applicant's claimed solder bumps, *Hayes*'s solder ball bumps 9 are neither sealed by resin nor cleaned. This clearly teaches away from Applicant's claimed invention, wherein Applicant's solder ball bumps are sealed with resin to provide strength and cleaned for greater adhesion. Instead, *Hayes*'s solder ball bumps 9 are fully exposed and thus subject to breakage. In fact, *Hayes* fails to even discuss that its solder ball bumps 9 are cleaned.

Claims 8, 10-11, 16, and 19-24 depend directly or indirectly from claim 7 and are therefore allowable for at least the same reasons that claim 7 is allowable.

Claim 9 has been cancelled.

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

C.) Rejection of claims 12, 13, and 17 under 35 U.S.C. §103(a) as being unpatentable over Hayes in view of Nishikawa et al. and Denning et al.:

Applicant respectfully disagrees with the rejection.

Applicant's independent claim 7 is allowable over *Hayes* as discussed above.

Nishikawa et al. and *Denning et al.*, taken singly or in combination, still fail to disclose or suggest solder ball bumps that are formed to connect to the circuit pattern, or sealed by resin film, or cleaned. Thus, *Hayes* in view of *Nishikawa et al.* and *Denning et al.* still fails to disclose or suggest Applicant's independent claim 7.

Claims 12, 13, and 17 depend directly or indirectly from claim 7 and are therefore allowable for at least the same reasons that claim 7 is allowable.

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

D.) Rejection of claims 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over Hayes in view of Nishikawa et al. and Denning et al. and further in view of Okumura:

Applicant respectfully disagrees with the rejection.

Applicant's independent claim 7 is allowable over *Hayes* in view of *Nishikawa et al.* and *Denning et al.* as discussed above.

Okumura still fail to disclose or suggest solder ball bumps that are formed to directly contact a circuit pattern, or sealed by resin film, or cleaned. Thus, *Hayes* in view of *Nishikawa et al.* and *Denning et al.* and further in view of *Okumura* still fails to disclose or suggest Applicant's independent claim 7.

Claims 14 and 15 depend directly or indirectly from claim 7 and are therefore allowable for at least the same reasons that claim 7 is allowable.

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

E.) Rejection of claim 18 under 35 U.S.C. §103(a) as being unpatentable over *Hayes* in view of *Jackson*:

Applicant respectfully disagrees with the rejection.

Applicant's independent claim 7 is allowable over *Hayes* as discussed above.

Jackson still fail to disclose or suggest solder ball bumps that are formed to directly contact a circuit pattern, or sealed by resin film, or cleaned. Thus, *Hayes* in view of *Jackson* still fails to disclose or suggest Applicant's independent claim 7.


Claim 18 depends directly or indirectly from claim 7 and is therefore allowable for at least the same reasons that claim 7 is allowable.

Applicant respectfully submits that the rejection has been overcome and requests that it be withdrawn.

CONCLUSION

In view of the foregoing, it is submitted that claims 7-8 and 10-24 are patentable. It is therefore submitted that the application is in condition for allowance. Notice to that effect is respectfully requested.

Respectfully submitted,

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